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# PRIZE DESIGNS

FOR

## RURAL SCHOOL BUILDINGS

*With Illustrations  
and Descriptions*

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By FREDERICK W. COBURN



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*From the Educational Publishing House  
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*WITH ILLUSTRATIONS AND  
DESCRIPTIONS*

BY  
FREDERICK W. COBURN  
OF THE EDITORIAL STAFF OF "THE SCHOOL JOURNAL"



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## PREFACE.

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It is apparent that an increased interest is being felt in many parts of the country relative to the school building, and with the desire for a pleasing general appearance of the school edifice, the subjects of lighting and heating (things too long neglected) have come to have a greater importance. These are discussed in a plain and practical way in this little volume, and it is believed that the suggestions will prove really helpful to school officials.

As is shown in this volume, there is no doubt of the fact that much ill-health is to be traced to confinement in poorly ventilated schoolhouses. Children who begin attending school at six years of age continue until they are sixteen, thus spending ten years in the schoolroom. The school term is now in the cities nearly ten months long. Therefore the school official who is charged with the duty of erecting a new building should resolve that it be properly ventilated.

The subject of lighting is also an important one. The old-fashioned schoolhouse had windows on all four sides; valuable as light is, cross-rays are irritating and injurious.

Good furniture can now be had at remarkably low prices. There is no excuse for employing a carpenter to make desks and seats. Machinery can outstrip hand-work. Fine hard woods, when kept smooth and bright, present an exceedingly pleasing appearance.

The effect upon character of a handsome school building, properly cared for, is worth taking into account. The schoolhouses of fifty years ago were in most cases a disgrace to the civilization which they represented. But a new era has been inaugurated, and all those eyesores in rural districts are soon to disappear. The danger now is that plans will be selected which lack in architectural beauty, though costing money enough for what might be really good.

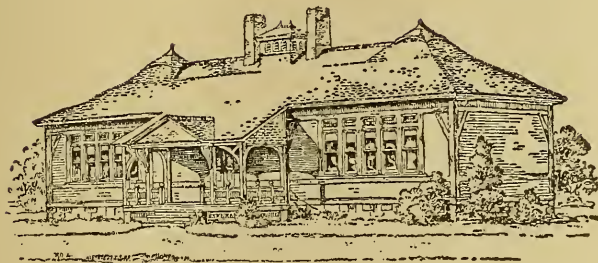
It is to aid in the selection of practical and yet beautiful designs for school buildings that this book has been prepared.

The publishers have given their efforts since 1874 to elevating and improving the teachers' profession, and the demand for better buildings is the result of such efforts on the public mind. Better teaching will naturally result in the erection of better buildings.

The publishers invite correspondence from any who are planning to erect a new building, and will cheerfully give advice and suggestions. They wish, in conclusion, to call the attention of school officers to their publications for teachers. Let the school officers ask the teacher to be a subscriber to some of our excellent publications. Let the teacher encourage the purchase of books for a school library,



and thus give further impetus to education in the locality.



Two-room Schoolhouse.

From "Town and Country Schoolhouses." By E. C. Gardner. E. L. Kellogg & Company.





## PRIZE DESIGNS FOR RURAL SCHOOL BUILDINGS.

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### WHAT A SCHOOLHOUSE CONSISTS OF.

THERE is no need to urge the necessity of good rural schoolhouses. Every one is aware that there are in every community, whether in city or country, school buildings that are a pain to the eye and a menace to the health. Sooner or later all of these will be replaced by better ones, and the real question is, Of what sort shall these be? By what principles shall we be guided in the erection of schoolhouses, so that they will be a credit, not a reproach, to a community?

Our first effort should be to realize, as clearly as possible, what a small, ordinary, and yet suitable schoolhouse should be. Evidently the schoolroom is our unit of construction. We must inclose a space of air with four walls, a floor, and a ceiling, and fit it to be a schoolroom. Let us see what will be required to make this a proper place for young people to spend their time in while obtaining an education.

For one thing, we shall need to have floor-space enough to hold a certain number of people, and we must also have sufficient air-space to contain the air they will need to breathe. In large city school systems the number of pupils is generally prescribed. In country schools it may vary according to the population of the district. It is a good rule, however, that a schoolroom should provide for from thirty-six to forty-eight pupils. More than fifty pupils will prove too much of a burden for one teacher. If there are likely to be many less than thirty-six in a one-room schoolhouse it is better to effect a consolidation with some other district.

Suppose that there are to be seatings, as in Fig. 1, page 21, for forty-five pupils. What does the possible presence of forty-six persons permanently occupying a room demand?

In the first place, it is clear that the seats must be advantageously disposed, so that each pupil may have his due share of light, heat, and the teacher's attention. It is the almost universal custom to prefer an oblong room, about twenty-seven feet by thirty feet. There should be an allowance of at least fifteen square feet of floor-space per pupil; it is better to allow eighteen square feet.

The question of air must be considered, and due arrangements made to supply enough of it for the pupils' needs. Physicians say that there should be an allowance of about 230 cubic feet of air to each person. This means that the room must be at least thirteen feet high. For other hygienic reasons this is a good height.

Obviously the air must be properly heated, and

removed when it becomes vitiated. This subject is especially treated under the heading "Heating and Ventilation."

It is also plain that there must be good light, plenty of it, and well distributed. The medical experts tell us that light should fall over the left shoulder. For this we shall need to get all our light from one side of the schoolroom. While this is the best plan theoretically, practically it is generally found expedient, in good rural schoolhouses, to have windows on each side of the room. The shades of one side can be kept drawn on ordinary occasions, and there are days when so little light comes from the sky that the daylight let in through all the windows is none too much. As a rule cross-lights are to be avoided for they are injurious to the eyes. Windows may be introduced at the end of the room, as in Mr. Reid's design, page 21, but they must certainly be provided with shades.

It is a good working principle that in a school-room the surface of glass admitting light should be from one-sixth to one-fourth the area of the floor surface. (It would be a good problem in mensuration for pupils to find out if this rule has been observed in their schoolhouse.)

It is needless to say that in most country schools the windows will be glazed with glass. There are some authorities who believe that oiled paper diffuses light better than glass, but it is doubtful if we have reached the point of using it, even though our ancestors did.

The teacher's desk should be placed in front of the pupils. It is preferable not to place it on a

platform, though this is the usual custom. Dust and dirt collect under such a platform, and pupils are liable to stumble over the edge. The secret of schoolroom economy consists in leaving out the unnecessary.

Some points regarding the floor of the schoolroom should be noted. In most country schools pine or hemlock flooring will be used on account of its apparent cheapness. As a matter of fact, a floor of maple or oak is in the end cheaper, and far more sightly. There are also asbestos preparations, such as asbestolith, which are very inexpensive considering their durability. They have the advantage of being thoroughly hygienic, since they offer no cracks for germs to lodge in. Where board floors are laid they should have one or two applications of linseed oil, and the cracks should be carefully filled.

Both the ceiling and walls will probably have to be plastered. Steel ceilings, while excellent, are not likely to be used in rural schoolhouses. The objection to plaster is that, although cheap in the first instance, its liability to crack renders it in reality an expensive covering, especially for the ceiling. Whitewash is undesirable, so easily does it rub off. The best plan is to paint the walls a light soft green. Green is a color so abundant in nature that our eyes are specially adapted to it, and receive from it the minimum of fatigue. Red tinting is particularly to be avoided; yellow is little better. Do not think of covering the walls with paper. Wallpaper, for very good reasons, is getting out of favor. It offers a lodging-place for disease-germs. Its

patterns, while they may seem attractive at first, are liable, from the endless repetition in them, to become very tiresome to the eye. Clean freshly painted walls, even though there is no sign of ornament or decoration on them, are pleasing to look at.

Square-headed windows are best for the classroom, for the reason that light enters in the greatest volume from about the top of the window. A circular or pointed head is, therefore, from the hygienic standpoint, a mistake. So, too, is a transom, as its bar inevitably casts a shadow across some of the desks. Double sashes are desirable, especially on the cold side of the room. They prevent the window from frosting, and are an assistance to the ventilation.

Each window should have a shade for excluding the light when the sun is strong, or when there is snow upon the ground. Shades that pull up from the bottom of the window are the best, according to the opinion of medical authorities, and there is no reason why they should not be used. In color the shades should be uniform with the walls, but a little darker. They should not be transparent, or even translucent. Many city schools use Venetian blinds. It might be well to consider this for a rural schoolroom. Several excellent varieties are manufactured.

The blackboard area should be as large as possible. Where the question of expense is a serious one, an inexpensive blackboard can be made, says Dr. E. R. Shaw \*, by pasting tough manila paper of suitable

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\* "School Hygiene" (The Macmillan Co.).

thickness on the wall and then painting and slating this. If the paint and slating are of a dark-green color, the effect will be found very pleasant to the eyes, and the legibility of white crayon thereon will prove fully equal to the legibility on a slate board.

Of course, the real slate blackboard is to be preferred where it can be afforded. Black and dark green are the best colors. Of late the green slating has become exceedingly popular. As young children are always to be found in a district school, the bottom of the blackboard should be not more than twenty-six inches from the floor. Its height should be four feet. The trough for erasers should be firm and solid, and there should be eraser-pockets like those made by Morris & Dunham, Dubuque, Ia.

It is to be presumed that our schoolroom is to be equipped with modern desks. There is no excuse nowadays for the old-fashioned benches. Say what you will about the remarkable men who sat on such benches in childhood, the fact remains that benches of this kind have been responsible for more curved spines than any other one cause. The world to-day wants men and women who are straight. The best is apt to be the cheapest in the end.

The dimensions of the aisles should be somewhat as follows: Blackboard aisles, 3 feet 8 inches; exterior aisles, 2 feet 4 inches; inside aisles, 24 inches.

A bench for recitations, as in Mr. LaBeaume's plan on page 27, should be provided. It is a great advantage to the teacher to get her class directly in front of her, and the change from desks to bench is likely to be welcome to the pupils. This

arrangement is especially adapted to rural school conditions.

The children's out-of-door garments must be kept in some kind of storage-room while the owners are at their lessons. To have them hanging in the open schoolroom is to invite pneumonia and diphtheria. If no special room or rooms adjoining the schoolroom can be provided, it is best to buy or have made a hygienic wardrobe. There are several ventilated school-wardrobes on the market. Inquiries on the subject will be cheerfully answered by the publishers of this book.

Every one-room schoolhouse, however, should be designed to have regular cloak-rooms, one for the boys and one for the girls. It is plainly desirable that the cloak-rooms should, when open, be in full view of the desk. This would seem to be a prime consideration in plans for a one-room school; yet it is frequently not observed. It will be interesting to compare the designs in this book with reference to this point. Several plans that are otherwise excellent appear to be faulty in this regard.

The essential thing about a cloak-room is that it provide for having the clothing of the children well ventilated. The practice of hanging hats and coats upon pegs or screws, driven into the wall, is a bad one. There should be a shelf running around the room, supported by brackets. In the middle of the shelf are hooks upon which the clothing may hang in such a way as to get circulation of air on all sides. Where the heating arrangements allow it, the air of the cloak-room should be kept warm, so that the clothing, when taken up, will be both dry and warm.



Besides the cloak-room the one-room schoolhouse will ordinarily have some kind of vestibule and a porch. If running water and a sewer system are at hand, the toilet-rooms for boys and girls should be located in the building. The rooms should be well ventilated and light. The closets must be simple and not liable to get out of order. One closet for every twenty-five boys and one for every fifteen girls is a good rule. Slate urinals are very necessary, since wood or brick speedily becomes foul.

In most country schools, on account of the lack of sewerage, outhouses have to be built. Most of the plans given in this book make no reference to this fact, but the architect Mr. E. C. Gardner\* would arrange for outhouses, connected by covered passages with the main building. To the objection that they are too near the schoolhouse, he replies that, if they are kept in inoffensive condition, they are not too near, and that if they were further away the temptation to neglect them would be greater.

Another authority maintains that the separate outhouses for each sex ought to be from forty to fifty feet from the building, properly hidden and protected by lattice-work. All are agreed that "decent privies, kept in decent order, are absolutely indispensable to the physical and moral welfare of the children." To keep them clean, there should be a vault of brick or stone, well plastered with cement and coated with tar. Dry earth should be used to keep the vault in order. Coal-ashes, well

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\* "Town and Country School Buildings." E. L. Kellogg & Company.

sifted, are equally good. Sand is ineffectual. At least three times a year the vaults should be thoroughly cleaned out. Only through constant vigilance can the outhouses be kept from becoming a menace to the health and morals of the community.

All the designs in this book contemplate some sort of attic. The architectural features of such an addition will be discussed later. Suffice it here to state that the attic ought to be available as a store-room for the school; for this purpose it should be floored over.

What shall be under the schoolroom is a matter of great importance. Most district schoolhouses will be found without cemented basements. The schoolhouse will stand a little above the bare ground, raised on stone supports or wooden props. For reasons of ordinary healthfulness the floor must be raised well above the outside surface. The ground under the schoolroom ought not to be excavated, for if this is done, a hole for the collection of rain-water is created—a cesspool which will be conducive to sore throats, pneumonia, and diphtheria. Nor is it enough to excavate and fill in with sand. The ground under the schoolhouse should be as free as possible from continual dampness. If necessary, a drain should be let in from under the building. Where, for reasons of economy, a schoolhouse has to be set upon posts, it is better that the open spaces between the posts be filled in with lattice-work. The appearance of the structure is thus improved, and the opportunities for small boys to undermine it are decreased.

A light, open, well-ventilated basement is, of course, desirable. Its walls should extend below the action of the frost. That means in the colder portions of the country at least four or five feet. Walls and ceilings should be finished in the simplest manner, and painted a light gray or buff. They should be impervious to water. A floor of cement is all right if the children are not allowed to play in the basement. When they are so allowed, the scuffling of feet over the cement raises a very unwholesome dust. The basement should be not more than eight or nine feet high; there is no use in making unnecessarily long flights of stairs to climb. If the basement contains a furnace there will, of course, be a bulkhead for the proper reception of coal and wood.

## SOME CHARACTERISTIC ONE-ROOM SCHOOLHOUSES.

THE elements that go to make up a one-room schoolhouse are mainly these: A schoolroom, closets, toilets, corridors or vestibule, porch, attic, and cellar. The covering, the outside shell of such an organism, is a matter of choice. There are several well-known architects who have plans and specifications for sale, in accordance with which a school board can erect a tasteful and commodious school building. It is believed, however, that no more practical designs have ever been made public than those in this book, which were obtained as the result of a competition, established in 1898, by *The School Journal*, in co-operation with Messrs. Bates and Guild, architectural publishers, Boston. The designs here shown were selected by the judge, Mr. E. M. Wheelwright, late city architect for the city of Boston, from a great number of plans submitted. It was understood that each architect was to contemplate a modern up-to-date country schoolhouse, attractive within and without, and capable of construction at a minimum of expense. Each of the designs approved by Mr. Wheelwright offers some distinct advantage of appearance and constructive utility, and deserves to be carefully studied by school trustees who purpose

to build. Even when a plan is not followed outright, it will frequently yield valuable suggestions.

Final choice from among these and other designs must depend upon certain considerations of expense, utility, and attractiveness. There is no question but that the appearance of a building is of importance. This, too, needs to be remembered, that a building which looks well on paper may present a sorry appearance when it is planted in Derryville. This does not generally signify that the school board of Derryville has been caught by an architectural sharper. It means that the building has been in some way placed in an environment to which it is unsuited. It is not enough to let a daughter of one of the school commissioners pick out a design that seems to her pretty; the whole board should think the matter over seriously, and decide what kind of schoolhouse will go best on the site that has been selected.

For instance, the schoolhouse planned by Mr. G. D. Reid, page 21, is admirable for practical reasons, and would certainly look well in most situations. But it might not appear to advantage when set upon high ground. A few suggestions as to the selection of the site are therefore in order.

Very elevated ground, and particularly hilltops, should be avoided. Not only is this a matter of common sense, since the winter winds have the greatest sweep upon the hill, but for reasons of appearance the high ground ought not to be chosen. Only an extraordinarily handsome building presents a good appearance when put on the top of a hill. Not one of the excellent designs in this book but would be a

botch on the landscape if set high on a ridge with no surrounding foliage. When such a structure in such a place can be hidden among trees the effect is not so bad. Wherever the site is chosen, the schoolhouse should be so situated that the land will slope away from it gently on all sides. It is preferable, of course, that a fairly level space should be selected. As to the amount of land required, a fair allowance in villages and towns is that suggested by Prof. W. H. Burnham, of Clark University, who holds that thirty square feet per pupil is enough to meet the ordinary requirements of the playgrounds. This would give for a school of fifty pupils 1500 square feet plus the space needed for the schoolhouse and outbuildings. When land is cheap it would seem that a more liberal playground may be provided. A fair acre is none too much for a country school.

The character of the soil must be looked into before a schoolhouse is planted upon it. Clayey land should be avoided, since it holds moisture and renders the ground-air in its neighborhood unwholesome and sometimes malarial. Any spot on which the vegetation grows very rank is certain to be a bad site. No schoolhouse should be set in a swamp if there is any dry land in the township. Two or three shade-trees are desirable, but they should not obstruct air and light; they ought not to stand to the south or west of the building.

Effects of landscape architecture need not be sought after in the arrangement of the school grounds. The prime object of the yard is to give the children a place to play in. At the same time it should not be unsightly when laid out, nor should

it be allowed to become unsightly. There may well be a little ornamental shrubbery by the fence, and in front of the schoolhouse some well-kept flower-beds. Most children can be educated to respect these decorative details if teachers themselves display interest in the school grounds. One of these days the elements of agriculture will be taught in all country schools—as is now the case in several countries of Europe—and then a respect for experimental forcing-beds and rows of vegetables will be inculcated in every boy.

One very good scheme of arranging the school grounds is to have the playground in the rear of the school building, leaving the front yard sacred to decorative effects. A broad circular pathway of gravel leading up to the school-door will make an agreeable grass-plot of semi-circular shape. This should be graded and kept as a lawn, with a flower-bed or two on it.

It will now be profitable to consider briefly some of the admirable plans submitted in the *School Journal's* architectural competition. The one that received first prize, page 21, is by Mr. G. D. Reid, 20 Magnolia St., Malden, Mass. It may not to all readers appear to have the most attractive exterior among the designs submitted, but there is no doubt that for practical working purposes it is the best in the competition, and one of the best ever drawn. Such a schoolhouse can be contracted for with any good master carpenter and erected at comparatively small expense. It is simple, unpretentious, dignified, everything that a rural schoolhouse should be.



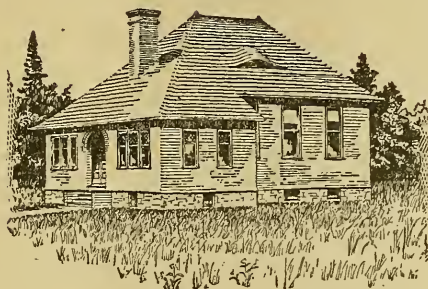


FIG. 1.—Elevation of Model One-room Schoolhouse. First Prize Design.

By Mr. G. D. Reid, Malden, Mass.

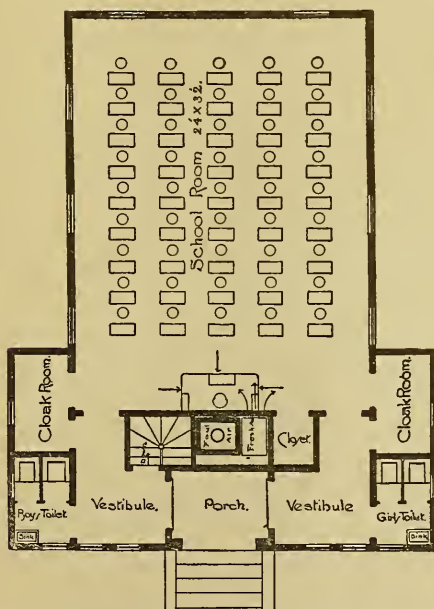


FIG. 2.—Floor Plan of Model One-room Schoolhouse.

There are, as will be seen, forty-five seats in the room, arranged in five rows of nine each. This arrangement is one of the best that can be made from the standpoint of discipline, since it lessens the teacher's angle of vision.

The problem of lighting has been very satisfactorily solved. The windows in the rear of the schoolroom are unnecessary, and were, perhaps, introduced for the sake of symmetry. They are so placed, however, that they will not create disagreeable cross-lights. The cloak-rooms and toilet-rooms have light unstinted, as they should.

The vestibules are large, and the cloak-rooms well situated both with respect to each other and to the schoolroom. The cloak-rooms are both commanded from the teacher's desk—an important consideration in discipline. In townships where, for lack of running water, the toilets have to be outside the building, it will be possible to increase the size of the vestibule by the omission of the toilets.

The exterior view is apparently not so interesting as in some of the other designs, but the proportions are good, and it will be discovered that such a school-house improves in appearance upon acquaintance. The entrance is perhaps a little uninviting. Some of the teacher's thought may be exercised upon the problem of making it more attractive by the planting of vines.

The second prize design, page 23, was submitted by Mr. Turner Hodgdon, 172 High St., Brookline, Mass.

It will be noted that the schoolroom has no windows in the rear. This is in accordance with the

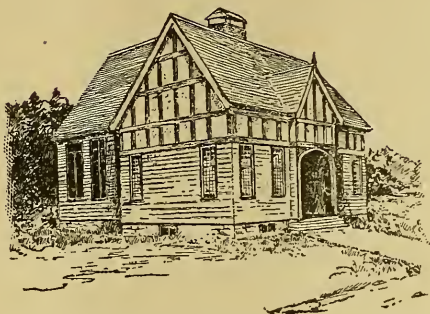


FIG. 3.—Model One-room Schoolhouse. Second Prize Design.  
By Mr. Turner Hodgdon, Brookline, Mass.

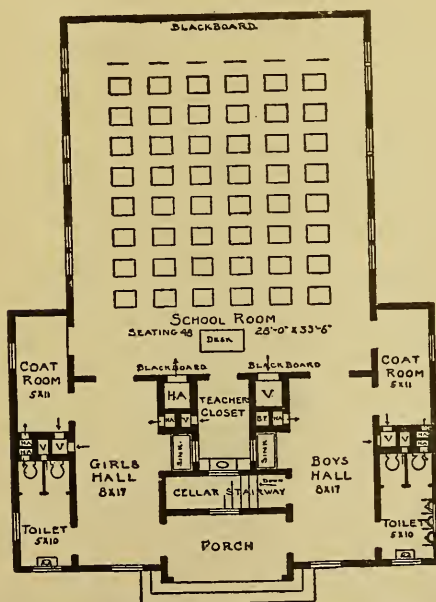


FIG. 4.—Floor Plan of One-room Schoolhouse.

best opinions of experts. The vertical cross-bar in the side window is to be accounted as a mistake, for it will cast an ugly shadow across desks. Otherwise the arrangements are excellent. The seats are distributed in six rows of eight each. This plan brings the teacher's desk in front of an aisle. The entire wall space in the rear has been utilized for a blackboard; there is no doubt that large blackboards are very desirable. The placing of the halls, coat-rooms and toilet-rooms is to be especially commended. The exterior is very satisfactory. The scheme of allowing some of the constructive beams to show on the outside is a good one artistically. The outside of a building ought to reveal something of its inner structure. When beams show, however, they should be kept well painted as a protection against decay.

The third prize design, of which the front elevation and floor plan are displayed, on page 25, is the creation of Mr. Louis LaBeaume, of the Boston Architectural Club. The exterior, as will readily be seen, is somewhat more ornate than that of the preceding designs. Such a building would lend itself well to construction in brick or stone. It is perhaps rather better adapted in appearance to the village street than to the open country. Within one finds that a somewhat more elaborate scheme of arrangements has been planned for than in the preceding designs. The foot-warmers in the vestibule, the amplitude of the toilet provision, the size of the platform on which the teacher's desk stands, the bench for recitations—all these things are excellent in their way, but perhaps especially fitted for use in a schoolhouse in a well-to-do district, where

the school board is anxious to have a building with as many conveniences as are reasonably possible. The placing of the wardrobes and toilet-rooms may

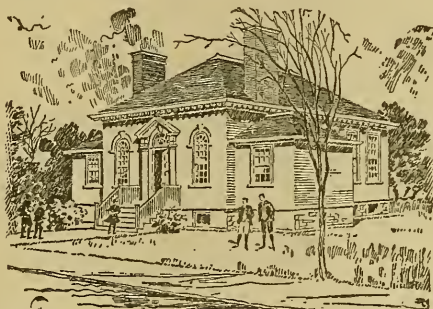


FIG. 5.—Model One-room Schoolhouse. Third Prize Design.  
By Mr. Louis LaBeaume, Architectural Club, Boston, Mass.

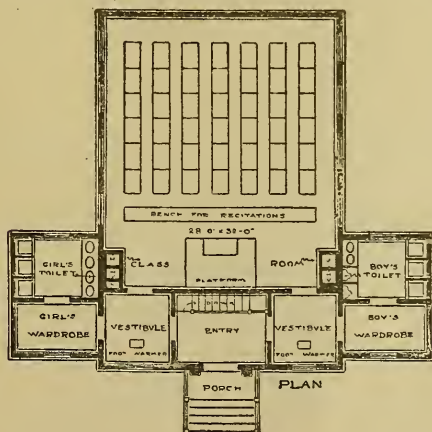
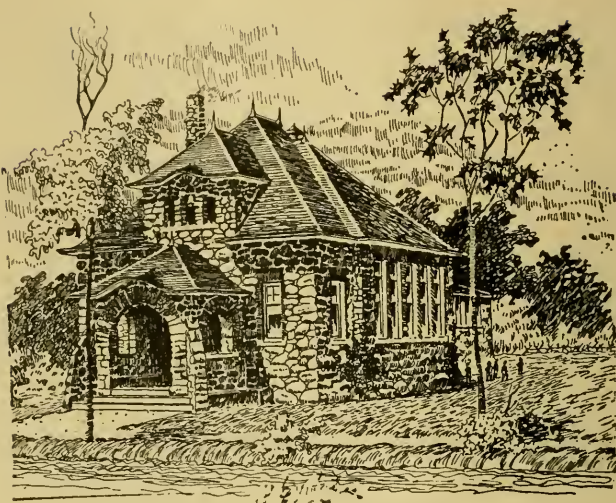


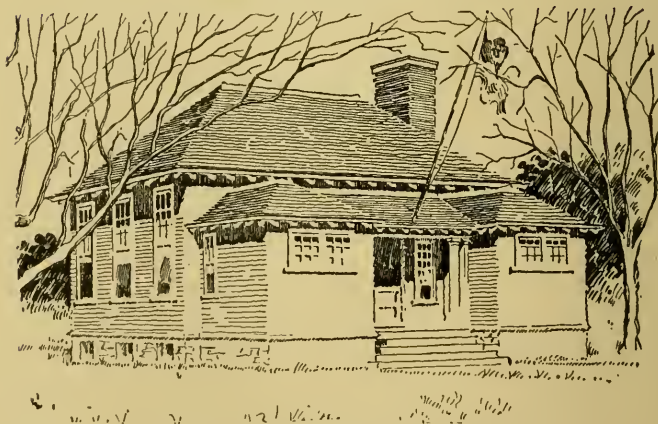
FIG. 6.—Floor Plan of Model One-room Schoolhouse.

be regarded as a little unfortunate by some teachers. It has also been suggested that the seats had better be in six rows of seven each, thus allowing the



**FIG. 7.—Model One-room Schoolhouse.**

By Mr. Fred. J. Bliss, Akron, O.



**FIG. 8.—Model One-room Schoolhouse.**

By Mr. Louis LaBeaume, Architectural Club, Boston, Mass.



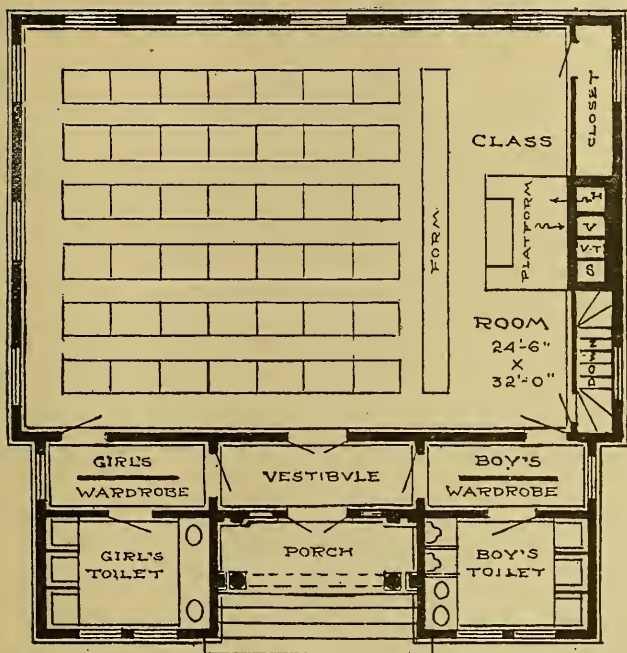


FIG. 9.—Floor Plan of Model Schoolhouse. With Fig. 8.

teacher to face an aisle instead of a solid row of heads.

Among the non-premiated designs the one here presented as Fig. 7 was adjudged to have considerable merit. The architect was Mr. Fred. J. Bliss, 54 Savings Bank Building, Akron, O. It is intended to be of field or quarried stone, laid at random, with brick trimmings about doors and windows. The roof is supposed to be of shingles dipped in stain.

As will be seen from the plan, the light enters



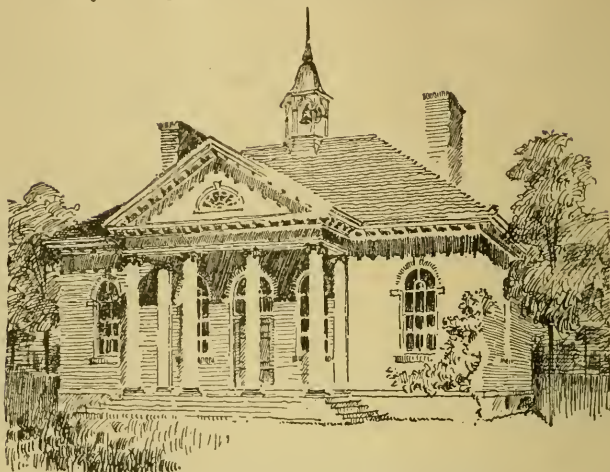


FIG 10.—Model One-room Schoolhouse.  
By Mr. Raymond F. Bocorselski, Hartford, Ct.

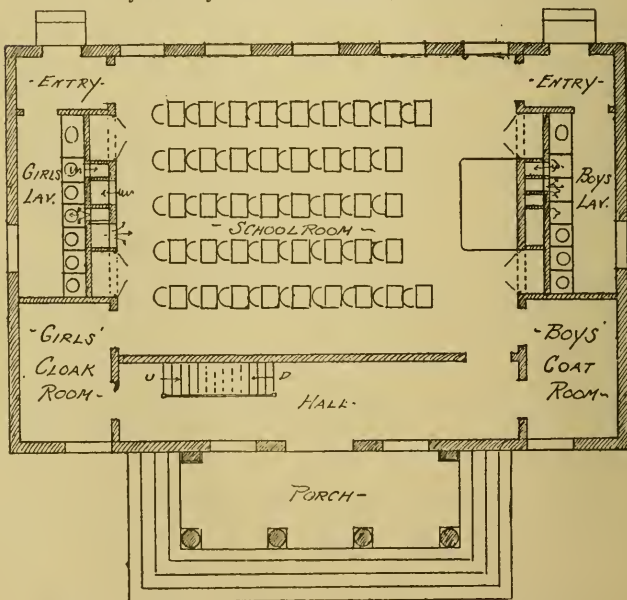


FIG. 11.—Plan of One-room Schoolhouse. With Fig. 10.



FIG. 12.—Model One-room Schoolhouse.  
By Mr. E. O. Kuenzli, Milwaukee, W .

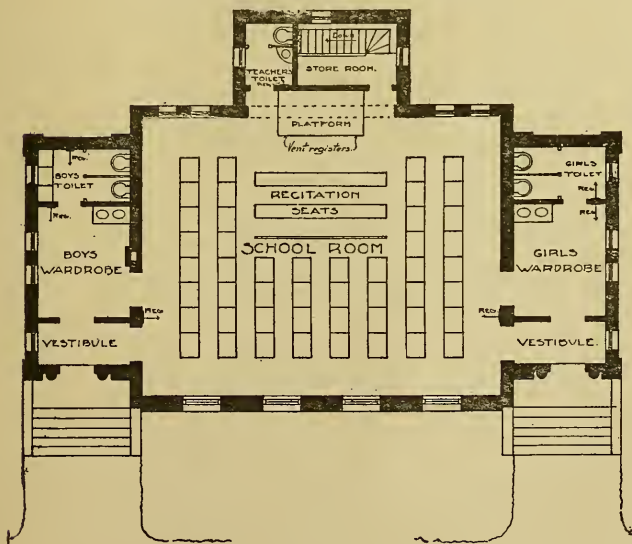


FIG. 13.—Plan of One-room Schoolhouse,

almost entirely from behind and to the left of the pupils, the wall to their right being taken up with blackboard. The only window on the right is that by the teacher's desk.

Mr. Louis LaBeaume submitted another design, here marked as Fig. 8. It suggests a plain, well-proportioned schoolhouse, with convenient and economical characteristics. Entrance to the schoolroom is from the side. The children thus get light from the rear and the left. A furnace in the cellar heats all the rooms.

Rather an elaborate, though not unattractive design, is shown in Fig. 10. One would not choose such an exterior for an open space in the country, but if it is desired to erect a schoolroom in one of the villages, say of central New York State, where there are numerous examples of the craze for Ionic and Corinthian columns which swept the country about 1850, you will find this design just suits. It is fitted for a street that has houses with Grecian fronts.

Two chimneys are necessitated by this design. The placing of the toilet-rooms at either end of the classrooms has obvious disadvantages. The light comes entirely from one side, a great advantage if one can be certain that it will be strong enough for the row of children who are nearest the blackboard. There are doors in the rear, leading to the playground. These will be a great convenience.

This plan was drawn by Mr. Raymond F. Bocorselski, 141 Trumbull St., Hartford, Conn.

Something quite ornate is shown in Fig. 12. Among suburban residences it would show up very well. The plan offers a broad frontage to the street

with an entrance at either end of the classroom. As to the question of light, there are four windows in the rear of the pupils, and two small ones to each side in front. The heating and ventilation plan is very simple, and plenty of blackboard space is given. The author is Mr. E. O. Kuenzli, 344 Second Ave., Milwaukee, Wis.

Exceeding simplicity is the marked consideration of Fig. 14. The building is very plain, with an en-

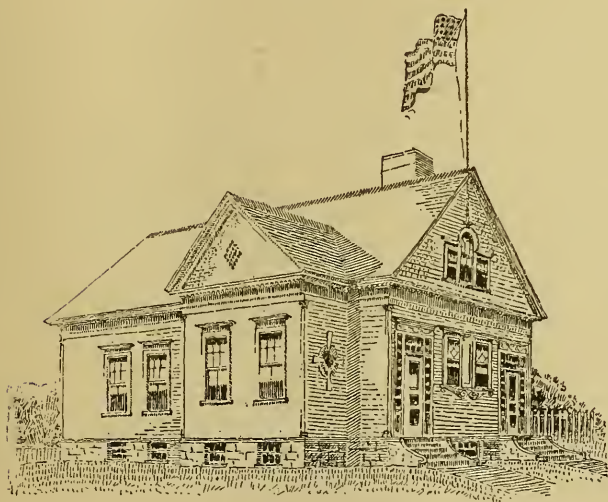


FIG. 14.—Model One-room Schoolhouse.  
By Mr. Charles V. Burgess, Roslindale, Mass.

trance for girls and one for boys. The cloak-rooms are visible from the teacher's desk. The toilets are placed in a novel position, but there is no reason why, if ordinary oversight is exercised to keep them

from emitting odor, their placing should not be satisfactory. The arrangement of seats, of blackboard space, and the heating and ventilating of the classroom are admirable. The design was made by Charles V. Burgess, 80 Cohasset St., Roslindale, Mass.

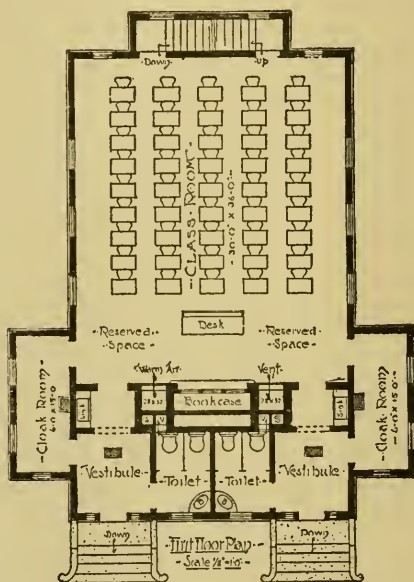


FIG. 15.—Plan of One-room Schoolhouse. With Fig. 14.

## TWO-ROOM SCHOOLHOUSES.

THE principles that apply to planning a one-room school building are equally applicable to a two-room schoolhouse for a rural community. In such a structure as the latter, however, some little economies of space and equipment are possible.



FIG. 16.—Two-room Schoolhouse. First Prize Design.  
By Mr. Anthony P. Valentine, Jr. Philadelphia, Pa.

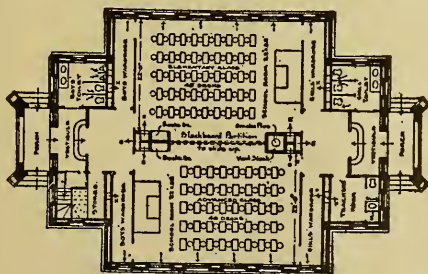


FIG. 17.—Plan of Two-room Schoolhouse. With Fig. 15.

The model country schoolhouse which received the first prize in the *School Journal's* recent com-



petition for two-room buildings shows admirable taste and arrangement. The building is thoroughly compact, without the waste of building material and ground space which is caused by wings. There is very little exterior ornamentation, but what little is used has been most effectively employed. It will be noticed that provision has been made for separate entrances for boys and girls. This is in every way desirable; it is also economical, since it results in a saving of floor space.

The first point to observe in considering the exterior is that the two classrooms face in opposite directions. This is in order to bring the light over the pupils' left shoulders, in accordance with the best expert opinion of to-day. Another point of excellence is that the blackboard partition between the two classrooms is not stationary, but is counterbalanced so as to slide up, and allow one teacher, in the absence of the other, to supervise both classes. Joint exercises in singing, recitations, etc., are thus rendered possible. The arrangement of the wardrobes, toilet-rooms, and store-rooms has advantages that will be instantly appreciated.

The heating and ventilating system is intended to start with a heater that will supply, not a small amount of hot air, but a large amount of warm air. This will be admitted to the rooms where indicated on the floor plan, at a level of about midway the story height. The ventilation is effected through registers below the windows at floor level. These registers are connected with the vent-stack, whose "pull" is due to heat from an inclosed smoke-flue, while the push, due to the intake of air into the



rooms, insures the positive action of the system. A special stack over the space marked "books" ventilates the loft.

The height of the rooms is thirteen feet. The windows are four feet by nine feet, and they are three feet from the floor. The designer of this admirable building is Mr. Anthony P. Valentine, Jr., 1424 Ritner St., Philadelphia, Pa.

The second prize design is by Mr. A. C. Fernald, architect, of Boston. It has several points of marked excellence to which attention may be called briefly.

The placing of the desks is somewhat unusual, but by many teachers it will be regarded as very satisfactory. At least the teacher will not get the light full in the face. The windows are of ample size, and of a shape to furnish a steady light, especially upon lowering days.

The arrangement for disposing of the children's clothing is such as to promote good order in the school. The division of the cloak-rooms will prevent over-crowding and boisterousness. The lavatories are well placed.

Externally the building is very attractive indeed. Such a schoolhouse will look especially well on level or gently rolling ground. It will not look so well among tall trees. The architectural effect is on the whole excellent, and is derived more from good proportions than from any elaborateness of design. The pleasing variety in the shapes of the windows is worthy of note—so, too, is the interesting way in which the chimney breaks the monotony of the level of the roofs.



FIG. 18.—Two-room Schoolhouse. Second Prize Design.  
By Mr. A. C. Fernald, Boston, Mass.

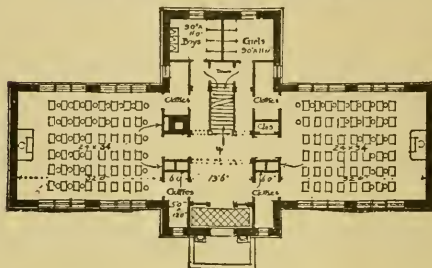


FIG. 19.—Floor Plan of Two-room Schoolhouse. With Fig. 17.

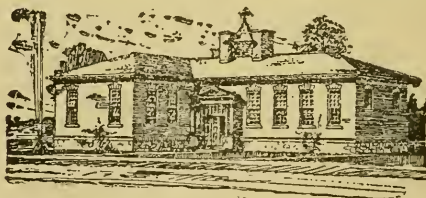


FIG. 20.—Two-room Schoolhouse. Third Prize Design.  
By Mr. George Howell Harris, Chicago, Ill.

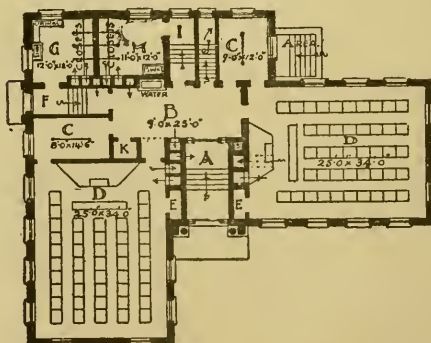


FIG. 21.—Floor Plan of Two-room Schoolhouse. With Fig. 19.

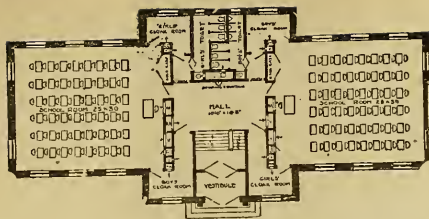


FIG. 22.—Floor Plan of Two-room Schoolhouse.  
By Mr. Arthur H. Buckley, Chicago, Ill.

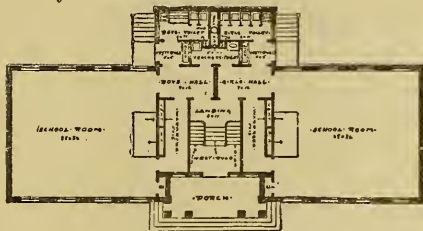


FIG. 23.—Floor Plan of Two-room Schoolhouse.  
By Mr. W. Adair Price, Montreal, P. Q.



FIG. 24.—Two-room Schoolhouse.  
By Mr. Julius E. Heimerl, Milwaukee, Wis.

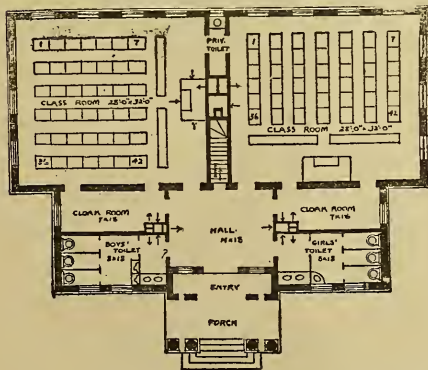


FIG. 25.—Floor Plan of Two-room Schoolhouse.  
By Mr. Frederick A. Miller, Rochester, N. Y.

The third prize design is by Mr. George Howell Harris, West Monroe St., Chicago, Ill. It will be noticed that the classrooms are lighted from three sides—no great advantage for pupils or teachers. The so-called “cart-wheel” plan has been followed in the disposition of the desks. Many teachers like the “indentation” as here exhibited. The placing of the cloak-rooms (C), tho ingenious, leaves something to be desired as far as discipline is concerned. That is to say, the teacher cannot sit at her desk and still keep an eye on the cloak-room. The teachers’ closets are good features.

The side entrance for boys (F) is an agreeable little luxury. Notice that the toilet-rooms stand on a lower level than the rest of the floor. They are thus in a measure kept separate.

The exterior is simple and appropriate. The doorway has some architectural distinction, and its character is cleverly echoed in the belfry. The flag-pole, to be in harmony, ought to be much taller; or it should be kept out altogether.

Other designs are shown by Messrs. Arthur H. Buckley, Chicago; W. Adair Price, Montreal; Julius E. Heimerl, Milwaukee; Frederick A. Miller, Rochester.

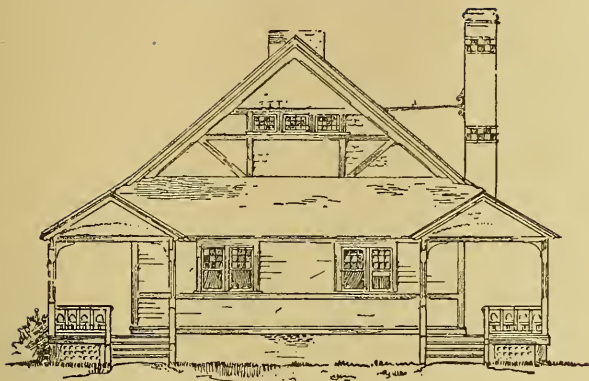
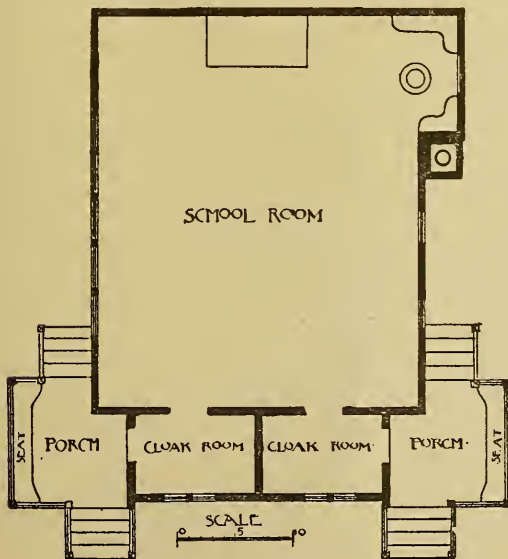


FIG. 1.—Front Elevation of Inexpensive One-room Schoolhouse.  
From "Town and Country Schoolhouses," E. L. Kellogg & Co.



FLOOR PLAN.

FIG. 2.—Floor Plan of above Schoolhouse.

## HEATING AND VENTILATION.

THE necessity for good heating and good ventilation, to the comfort and progress of pupils, is admitted by all. Yet it is true that there are still thousands of schoolhouses in the country in which the bad air and ill-regulated heat serve to endanger the health of the pupils, and to diminish appreciably their capacity for work. For country schoolhouses, especially, the need of good ventilation has not yet been adequately felt. It is supposed that the children who attend these schools get a great deal of fresh air in their daily labor, and are, therefore, enabled to endure a considerable amount of air-poisoning at home and at school without any apparent ill-effect. Fortunately in many schools the number of pupils is so small that the natural ventilation afforded by cracks and windows and other inlets is almost sufficient.

In a school, however, where every seat is occupied, where the visitor on a winter's day, coming in out of an atmosphere laden with ozone, finds his nostrils assailed with bodily odor; where some of the children sit and shiver while others, nearer the stove, writhe under the excess of heat—in such a school measures ought to be taken at once for improvement in both heating and ventilation. It is just

because these things are not attended to that country children, who ought almost to an individual to grow up to be magnificent specimens of physical manhood and womanhood, develop weakness rather than strength.

What does it mean to breathe impure air?

For one thing, it means not to get one's normal amount of oxygen, the element in the atmosphere that is absolutely essential to the maintenance of life. Pure outside air contains, roughly speaking, about twenty per cent of oxygen. The other main constituent of air, nitrogen, will not support life. A lighted candle dipped into a jar of nitrogen goes out instantly. So, too, will a human being if plunged into an atmosphere without oxygen.

Now when a human being respire a cubic foot of air, he takes from it about four per cent of its oxygen, which is absorbed by the blood in the lungs, and gives in its place about four per cent of carbonic acid gas, or carbon dioxide, mixed with some animal impurities. Thus, if in a carefully sealed room, full of people, each person should exhaust just his share of the fresh air, and then should depart, the atmosphere of that room would contain only sixteen per cent instead of twenty per cent of oxygen. But as a fact, in a room full of people, each one keeps inhaling air that another has respired, and, were no fresh air brought in from the outside, the supply of oxygen would presently be completely exhausted, and the inmates would all perish, drowned in nitrogen and carbonic acid gas.

In rooms where only partial ventilation is present, the inmates do not die of immediate suffocation, but



their lives are enfeebled and shortened by failure to receive their fair allotment of oxygen. The loss of oxygen alone is not, however, the greatest evil attendant upon poor ventilation. Not only do we fail to get what we need; we get what we ought not to have. The carbonic acid gas that is given off from the lungs is not of itself a dangerous gas. Indeed, as we take it in various soda-water preparations it seems to have a beneficial effect upon digestion. But it is a gas that frequently travels in bad company. When it comes from the lungs it is attended with a lot of animal matter which is subject to decay, developing rank poisons as it putrefies. It is generally believed that it is this decaying animal matter which causes the odor so painfully apparent in overcrowded rooms. As the amount of carbonic acid gas in the atmosphere increases, so the amount of this deleterious refuse matter grows greater, and the measure of the amount of the one is approximately the measure of the amount of the other. There are tests for carbonic acid gas which may easily be applied\*, but for all practical purposes the test of the nostrils will probably be sufficient in the rural school. If there is a bad smell in a room when one comes in from the outside, then it is clear that the children and teacher are breathing some deadly poison. The air should be quite free from odor.

Even supposing that plenty of air is furnished in a schoolroom, one cannot feel certain for that reason that the quality is right. Air may get into the

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\* Vide "School Sanitation and Decoration" (D. C. Heath & Co.), page 36.

school from the cellar or even after passing through outhouse vaults. It is important that the sources from which air is taken should be thoroughly satisfactory, and still more important is it, if heated air is supplied to the school, that it should contain the requisite amount of moisture. On this topic something will be said later on.

What can be done properly to heat and ventilate a country schoolhouse depends entirely upon local conditions, upon the nature of the schoolhouse, the amount of money the officials in charge are willing to spend, etc. It is certainly false economy to save and at the same time decrease the working efficiency of the school. The actual capacity of the individual pupils to learn may be decreased as much as one half by bad ventilation.

Many a rural school has no heating apparatus but a plain, unjacketed wood stove. This, to most people, seems enough, but a little consideration will prove that such a schoolroom is imperfectly heated and ventilated. The best thing that can be done in such a room is to introduce an open fire-place, for the value of a fire-place as a means of ventilation is considerable. Exceedingly wasteful of fuel though it is, it accomplishes the essential purpose of changing the air continuously; and in many communities wastefulness of wood is no great objection. Farmhouses of a century ago were heated with fire-places almost exclusively. In too many of those of to-day the old-fashioned fire-place has been bricked up or, if still in evidence, is hardly ever used. The cylinder stove, which heats a room very hot, and burns up every atom of moisture in the air, has

come into favor among people who wonder why they are less robust, why they are more subject to pneumonia, chronic colds, nervous disorders, and other ills than their ancestors were. It would be an interesting study to determine how much of the much-talked-of nervous depletion of the native American stock is due to the stoves they have been buying for the past half century. Through them they get plenty of heat, but no ventilation.

For the schoolhouse which is not supplied with a thoroughly modern system of heating and ventilating an open fire-place should be provided. The æsthetic value of the fire-place is a matter not to be despised. A thoroughly homelike atmosphere is created by the bright crackling fire.

Of course, the fire-place alone will not heat the room. A stove must also be used. The office of the fire-place is to assist in the ventilation.

According to State Supt. W. W. Stetson, of Maine, one may get very effective ventilation by the use of a cold-air box, which should run from an opening in the foundation wall, under the door, to a point immediately beneath the stove. Such an air-shaft should be as short and direct as possible. It ought to be about thirty inches square for a one-room schoolhouse. At either end there should be a coarse wire netting, and about one inch inside of this netting screens should be stretched similar to those used in dwelling-houses to exclude flies.

The opening below the stove ought to have a slide, so that the shaft can be completely closed when the room is cleaned or swept. About the stove should be set a Russia iron jacket. This must be

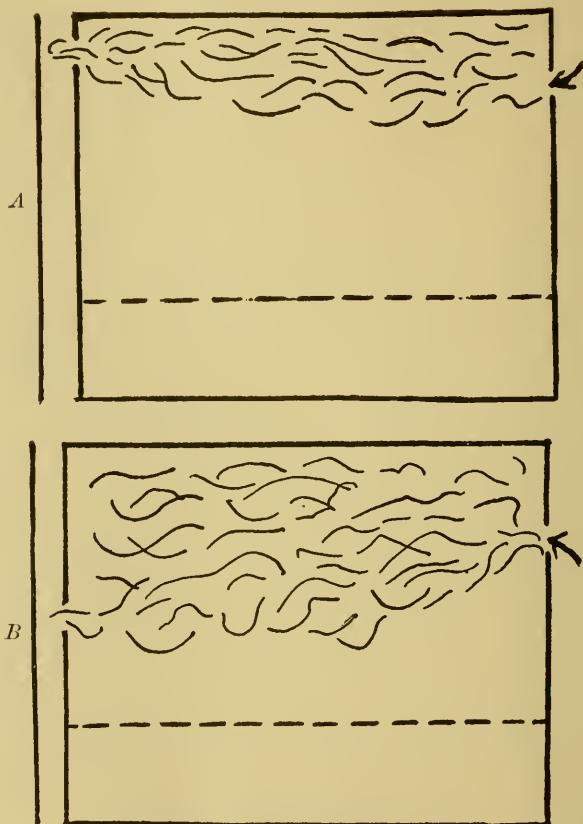
L. of C.

fastened firmly to the floor. It should rise at least eight inches higher than the stove itself. The sides of the jacket should be distant at least six inches from the stove. Fresh air can then be admitted to the room in any required quantity, and is brought near enough to the stove to be properly warmed before it passes into the room. Could anything be simpler?

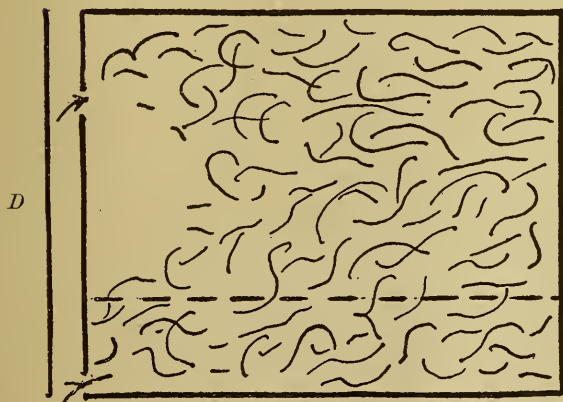
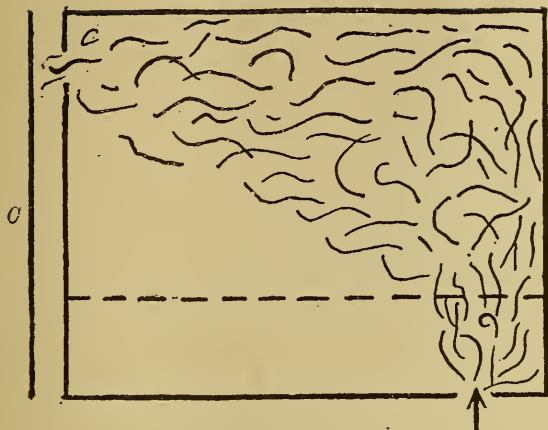
If the schoolroom is supplied with a fire-place, as suggested above, warmed thoroughly at least once a day, the problem of the ventilation flue will be solved. The vitiated air will go up chimney. Should there be no fire-place some special construction of the chimney or ventilating flue must be devised. Such a flue should be at least thirty inches square on the inside. One method is to make the smoke-stack of heavy sheet iron or thin cast iron, eight inches in diameter, and so placed that it will be easily connected with the heating apparatus. Next to this will be the ventilating flue. The opening into this flue should have some sort of register. One that is about twenty-eight inches square would be of the right size for an average schoolroom. Such an opening should be covered with a coarse wire netting; the cast-iron registers with formal designs offer too much hindrance to the passage of heat. The register should be very close to the floor.

The plan of placing the outlet for vitiated air very low in the room has now become general among schoolhouse architects. Years ago the custom was to locate it near the ceiling, on the principle that warm air rises, and will therefore pass out most easily from the top of the room. A series of ex-

## DESIGNS SHOWING RELATIVE DIFFUSION OF HEAT.



periments performed in 1877 by Mr. Warren R. Briggs, a well-known architect of Bridgeport, Conn., demonstrated that the preceding plan is defective because of the failure of the air-currents, when introduced from below and let out above, to reach the



whole room. The accompanying designs in which the many lines are used to trace the progress of the smoke show the relative diffusion under various plans.

In these experiments of Mr. Briggs the gravity

system of heating was pre-supposed. As this is a system which is likely to be used in rural communities that have got beyond the jacketed stove, some comments upon it are in order.

Gravity ventilation depends upon the principle that heated air rises, and in so doing diffuses itself. Most commonly it is effected by bringing hot air into a room through flues that connect directly with a furnace in the cellar. In other words the gravity system generally means ordinary furnace heat. The influx of heated air produces pressure on the sides of the room, and thus causes a constant outflow through the ventilating flues.

The greatest objection to the gravity system lies in the fact that its efficiency depends very largely upon the weather. The lower the temperature outside, the greater the quantity of air that can be moved. The system is liable to break down in spring and fall weather, when the outside air is a little too chilly to permit open windows. As it is, however, a very simple system, it is in common use throughout the country.

Steam and hot-water heat are still more commonly employed in school buildings. They require a separate system of ventilation. Recent experiments at Worcester, Mass., where two buildings of precisely similar character have been equipped, one with steam and one with hot-water apparatus, seem to prove that hot water is much more economical, so far as expenditure of coal is concerned. The original cost of installation of a hot-water system is, however, greater than of a steam system, and



there is the danger and expense of the freezing and bursting of pipes to be taken into account.

No detailed discussion of the various systems of steam-fitting is in place in this book. If the trustees of a rural schoolhouse purpose installing a steam or hot-water plant, they should seek the advice of a reliable expert in steam-fitting. This point, however, deserves to be made: it is folly to install steam or hot-water heating without providing a modern system of ventilation. The reason why city flats are so often unhealthy is that they are provided with steam heat and inadequate means of ventilation.

Ventilation may be accomplished in a steam-heated building by opening an inlet in the wall behind each radiator. In this way air is admitted from the outside, warmed by contact with the steam-pipes, and made to circulate through the room. This is often known as the direct-indirect method of ventilation.

Far more satisfactory than this plan is the use of ventilation fans. These are of two sorts, one called the plenum or pressure fan, which forces air into the room; the other, known as the exhaust or vacuum fan, draws air out. A school building which is thoroughly up to date in all its appointments should undoubtedly have one or another of these fans. The mechanical system of ventilation thus introduced is quite independent of weather conditions. It is applicable to supplying cool air in warm weather as well as warm air in cool weather. Though expensive to install at the start, it is economical in the long run. It represents at present the highest achievement in ventilation. To expect that country schoolhouses of the present day will be equipped with fans is palpably

absurd. Yet we may hope for a time when every rural school will have the best in ventilation.

There is one problem in ventilation which seems not yet to have been adequately solved. That is the matter of moistening the air. Schoolrooms that are properly heated in other respects are often rendered very unhealthy by the dryness of the atmosphere. The temperature of a schoolroom should be from 68 to 70° F.; the humidity, according to Dr. Edward R. Shaw, should be not less than 50 per cent.

One hundred degrees humidity, it should be explained, represents air charged with all the water vapor it can carry. The average humidity of the climate of Philadelphia is 69 per cent. This may be taken as about normal for the eastern part of the United States.

Nearly all the systems of heating in use dry the moisture out of the air. It is not uncommon to find the humidity in a schoolroom as low as twenty-five per cent. To breathe air as dry as this in the school, and air that is heavily charged with moisture out-of-doors, is to invite all sorts of throat and lung difficulties. More colds are due to these differences in humidity than to any other one cause.

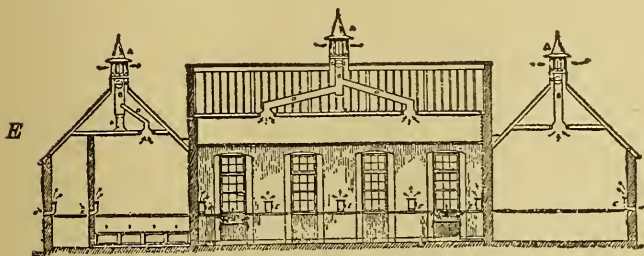
Some of the means that are adopted to humidify air may be mentioned. A hot-air furnace generally contains a water-pot. The evaporation from this helps to keep the air moist. It is rarely, however, of sufficient size or well enough placed to do the work it should do; and there is the likelihood that the person whose duty it is to fill the pot will neglect it.

In some cases where hot-air heating is in vogue, wet sponges are hung in the influx flues. This is a

very good arrangement, except that the sponges must be frequently filled or an automatic drip devised.

The excessive dryness of steam heat may be somewhat lessened if porous clay vessels are placed upon the radiator. It is a mistake to suppose that an escape of steam from the radiator will effect the desired result. The steam condenses into water within a few inches of the point of emission.

Where a stream of cold air from the outside is brought in upon the radiator, a small pipe can be run from one of the steam-pipes so as to emit a small



The Boyle System of Ventilation, as applied to English school with central hall.

jet of steam into the cold-air passage. This method, the invention of Mr. C. H. J. Woodbury, of Boston, has been found very effective.

Such, briefly stated, are the main facts about heating and ventilation as practiced in American schoolhouses. At the Paris exposition of 1900 the highest award made for a scheme of ventilating schoolhouses was bestowed upon the Boyle system of ventilation, which is here shown as applied to an

English school with central hall. The manner of application is easy to recognize. *A* represents the patent air-pump ventilators, the key to the whole system. *J* stands for the air-inlet brackets; *K* for the air-inlet tubes; *L* for the ventilating radiators.

Fig. 2. represents the same system as applied to a so-called "national school," of more than one story. *A* here represents the patent air-pump ventilators; *E* the air-inlet brackets, and *F* the ventilating radiators.

This system would certainly appear to be remarkably simple and wholesome.

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